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ORIGINAL ARTICLE

Mortality and Disease Characteristics Among Subtypes of Spontaneous Bacterial Peritonitis: Is there any difference?

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Abstract

BACKGROUND:

Spontaneous bacterial peritonitis (SBP) is the most common infection, with a significant fatality rate if remains untreated. Weakened immune systems render them more susceptible to infections, necessitating early detection and treatment. Among subtypes, classical SBP is expected to have the highest mortality, while non-neutrocytic bacteriascites (NB) are considered asymptomatic benign conditions. There is no data from Pakistan. Hence, our study was designed to compare the frequency, disease characteristics, and mortality among SBP subtypes and factors associated with mortality.

METHODS:

This cross-sectional study was conducted at the Aga Khan University Hospital, Karachi (AKUH) from 2007-2012. Patients aged ≥ 18 years and admitted with SBP were included. Data were collected about disease characteristics, 1, 6, and 12 months mortality.

RESULTS:

Overall 243 patients were reviewed. CNNA was the most common (68.3%), whereas NB was the least common (11.9%) subtype. The ascitic fluid total leucocyte count (TLC) was significantly lower (170-500x103/uL) in NB as compared to classical SBP (1150 - 6526 x103 /ul) and CNNA (800 -3400x103 /ul) ($p < 0.001$) in contrast to polymorphonuclear counts (PMN) which were significantly lower in NB as compared to classical SBP, NNBC respectively (56.0 ± 27.8% vs 85.5 ± 14.0% vs 72.4 ± 21.2%, $p<0.001$). Although not statistically significant, overall mortality was higher in NB and CNNA, as opposed to 1-, 6-, and 12-month mortality in classical SBP (31.2%, 7.7%, and 30.0%, respectively).

CONCLUSION

High morbidity-mortality associated with SBP, necessitates early identification and treatment. Lower TLC and PMN counts in NB may mislead, therefore clinical correlation can aid in the prompt administration of antibiotics. Although not statistically significant, overall mortality was higher in NB and CNNA, in contrast, classical SBP had higher 1-, 6-, and 12-month mortality.

Key Words:

SBP; Classical SBP; CNNA; Bacterascites (NB); mortality

INTRODUCTION

Spontaneous bacterial peritonitis (SBP) is not only the most common but fatal infection in patients with decompensated chronic liver disease if remains untreated (1, 2). Since its initial description in 1964 with an associated mortality of around 90 %, improvements in SBP care have changed it from a dreaded condition to a manageable consequence of chronic liver disease, even though its prevalence remained unchanged and there is an increased risk of recurrence. The overall mortality attributed to SBP has now been decreased to 20% due to early detection and quick empiric antibiotics (3). However, patients with cirrhosis and ascites have weak defense mechanisms making them more susceptible to numerous infections (4). This is evident from the previous studies whereby bacterial infections have been reported in around 30% of cirrhotic patients on admission or during inpatient evaluation (1).

SBP is defined as an infection of the peritoneal fluid accumulated as a consequence of portal hypertension in the absence of any identifiable intrabdominal source (5). This terminology was first used by Herold Conn in the early 1970s (6). The prevalence of SBP is higher among inpatients as compared to outpatients (10-30% vs 1.5-3.5%) (7). Several studies conducted at different centers in Pakistan have found the prevalence rate of SBP at around 28-31% in patients who had developed ascites. (8, 9). Patients with advanced liver disease presenting with recurrent SBP should be considered for liver transplant as the associated short-term mortality is high and there is an increased risk of developing other complications like hepato-renal syndrome and variceal bleeding. (10).

Clinical presentation in SBP varies from patient to patient. Most patients present with abdominal pain, fever, and diarrhea. While others may develop portosystemic encephalopathy or renal failure as the only presenting features (3, 11). Conversely, patients may be completely asymptomatic or have minimal noticeable symptoms. This is especially true when the illness is diagnosed during hospitalization (3, 11, 12). Early identification and treatment are therefore important for these patients because 50% of the patients die if remain, untreated (12). Additionally, patients who develop SBP have much poor survival at one year as compared to those without any history of SBP (38% vs.70%) (13). Additionally, several studies have looked at the predictors of mortality, but the majority of them focused on short-term, in-hospital outcomes (14, 15).

SBP has three variants, namely Classical SBP, Culture Negative Neutrocytic Ascites (CNNA), and Non-neutrocytic Bacterascites (NB) (9). After the recommendation of antibiotic prophylaxis in 2007, the prevalence of culture-positive ascites (Classical SBP) has decreased to 50-59%, nearly the same level as CNNA(16-19) while the prevalence of CNNA ranged from 33.3-58% and of NB ranged 11-26% (20-22). Although labeling each of these variants separately may appear arbitrary, it likely has clinical significance because classical SBP is the variant with the worst prognosis and is associated with the highest mortality (15).

NB usually represents the early phase of the ascitic fluid infection which is generally asymptomatic. However, if symptoms develop, this phase can rapidly evolve into classical SBP. One study showed a 50-170-fold rise in polymorphonuclear counts of the ascitic fluid within 40-70 minutes (23). These symptomatic patients should be treated with empiric antibiotics as per the European Association for the Study of the Liver (EASL) practice guidelines recommendations. (24). Hence, it is imperative to study the disease characteristics and mortality among various subtypes of SBP. The current study was designed to (1) estimate the prevalence of non-neutrocytic bacterascites in cirrhotic patients presenting with SBP (2) compare the clinical, and laboratory characteristics and mortality among various subtypes of SBP, and (3) estimate the 1-, 6-, 12- month mortality among SBP subtypes and factors associated with overall mortality in SBP.

MATERIAL AND METHODS:

This was a retrospective cross-sectional study conducted in the Gastroenterology wards of Aga Khan University Hospital, Karachi (AKUH) from January 2007 to August 2012. Patients aged ≥ 18 years and already diagnosed to have cirrhosis based on clinical findings, laboratory parameters, and imaging features, and were admitted with the diagnosis of SBP were included. Patients were excluded from the study if they had received an antibiotic in the preceding 30 days, had recurrent SBP with less than 6 months time interval between the two episodes, and had ascites due to tuberculosis, malignancy, or of unknown etiology. Patients with secondary causes of peritonitis such as gut perforation were also excluded.

Data collection procedure:

All patients admitted with SBP at AKUH during the study period were identified using ICD coding and their medical records were reviewed. Patients who met the eligibility requirements were finally enrolled. A pre-designed proforma was used to collect data on demographics, co-morbidities, cirrhosis etiology, presenting signs/symptoms, and laboratory data such as peripheral leucocyte count, liver function tests, prothrombin time, renal function tests, serum electrolytes, serum ascitic albumin gradient (SAAG), blood culture, ascitic fluid leucocyte and neutrophil count, ascitic fluid culture, CTP and MELD score, concomitant hepatocellular carcinoma, length of hospital stay, and mortality.

The study was conducted after approval from the ethical review committee, AKUH, and the work was done according to the declaration of Helsinki and sound practices.

Statistical Analysis:

Statistical software STATA version 14 was used to analyze the data. A descriptive analysis was performed for

demographic and clinical features and presented as mean ± standard deviation or median with the interquartile range after assessing the normality assumption for continuous variables and frequency (percentage) for categorical variables. Differences in proportions were assessed by using the Chi-square test or Fisher exact test where appropriate. Kruskal Wallis test was used for assessing the difference of means between types of SBP. Applied logistic regression was used for risk factors predicting mortality. A p-value of less than 0.05 was taken as significant.

RESULTS:

A total of 243 patients were included in the analysis as per the inclusion and exclusion criteria. CNNA was the most common (68.3%) subtype of SBP, whereas NB was the least common, affecting 29 (11.9%) of cases. Table 1 depicts the demographic and clinical features of the entire cohort of patients as well as the various subtypes of SBP at the time of enrollment. The mean age was 50.6 ± 11.8 years and most were male (153 (63%). Chronic hepatitis C (65%), followed by chronic hepatitis B (12.8%), was the leading cause of liver cirrhosis. Only 4.1% of the patients had alcohol-related cirrhosis. The most prevalent symptom on presentation was abdominal pain (44%), followed by fever (42.4%). In general, the patients with NB were less symptomatic. However, no statistically significant difference was found in demographic or clinical characteristics among SBP subtypes.

Table1: Comparison of clinical characteristics among variants of SBP

	All patients n=243	Classical SBP n=48	CNNA n=166	NB n=29	p-value
Age, in years	50.6 ± 11.8	50 ± 12.4	50.7 ± 11.5	51.3 ± 13.0	0.89
Gender Female male	90 (37.0) 153 (63.0)	15 (31.2) 33 (68.8)	60 (36.1) 106 (63.9)	15 (51.7) 14 (48.3)	0.18
Comorbid Diabetes Hypertension Ischemia heart disease	116 (47.7) 83 (34.2) 59 (24.3)	21 (43.8) 18 (37.5) 14 (29.2)	81 (48.8) 54 (32.5) 3 8(22.9)	14 (48.3) 11 (37.9) 7 (24.1)	0.82 0.73 0.67
Cirrhotic etiology HBV HCV Alcohol NBNC HBV + HDV	31 (12.8) 158 (65.0) 10 (4.1) 27 (11.1) 17 (7.0)	7 (14.6) 31 (64.6) 4 (8.3) 3 (6.3) 3 (6.3)	23 (13.9) 107 (64.5) 6 (3.6) 19 (11.4) 11 (6.6)	1 (3.4) 20 (69.0) 0 (0.0) 5 (17.2) 3 (10.3)	0.41
Previous history of SBP	11 (4.5)	4 (8.3)	7 (4.2)	0 (0.0)	0.22
Symptoms/Signs					
Fever	103 (42.4)	24 (50.0)	65 (39.2)	14 (48.3)	0.32
Abdominal pain	107 (44.0)	24 (50.0)	74 (44.6)	9 (31.0)	0.26
Encephalopathy	75 (30.9)	8 (16.7)	59 (35.5)	8 (27.6)	0.04
Nausea	14 (15.8)	2 (4.2)	9 (5.4)	3 (10.3)	0.52
Vomiting	19 (7.8)	3 (6.2)	11 (6.6)	5 (17.2)	0.15
Diarrhea	18 (7.4)	6 (12.5)	9 (5.4)	3 (10.3)	0.17
Septic shock	2 (0.8)	0 (0.0)	1 (0.6)	1 (0.6)	0.26
Gastrointestinal bleeding	15 (6.2)	6 (12.5)	7 (4.2)	2 (6.9)	0.10
Ileus	1 (0.4)	0 (0.0)	0 (0.0)	1 (3.4)	0.11
Abdominal distension	90 (37.0)	19 (39.6)	59 (35.5)	12 (41.4)	0.77

CNNA= Culture Negative Neutrocytic Ascites, NB= Non-neutrocytic Bacterascites

Table 2 compares laboratory values among the various subtypes of SBP. Most patients were found to have advanced liver disease at the time of presentation as shown by the high mean CTP score= 10.9 and mean MELD score= 22.4. Most of the laboratory parameters were not statistically significant among various subtypes of SBP. However, ascitic fluid total leucocyte count (TLC) was significantly lower (300 (170-500) 10x3/uL) in NB as compared to classical SBP (2950 (1150 - 6526) x103 /ul and CNNA (1500 (800 -3400)x103 /ul) respectively (p-value <0.001). The polymorphonuclear counts (PMN) in the ascitic fluid were also significantly lower in NB as compared to classical SBP and NNBC respectively (56.0 ± 27.8% vs 85.5 ± 14.0% vs 72.4 ± 21.2%, p-value <0.001). Only 33.3% of classic SBP have positive blood cultures, even though the proportion of positive blood cultures was significantly higher in classic SBP (p-value 0.001). As far as the ascitic fluid culture is concerned in contrast to CNNA (0%), a higher percentage of patients in classical SBP (100%) and NB (93.1%) showed a positive ascitic fluid culture (p <0.001). Additionally, in comparison to CNNA (12.6%), the vast majority of patients in classical SBP (89.6%) and NB (86.2%) had received the proper antibiotics (p <0.001). There was no statistically significant difference in the length of antibiotic use between the different subtypes of SBP. Although traditional SBP and NB had somewhat longer hospital stays than CNNA, the difference was not statistically significant.

Table 2: Comparison of laboratory parameters among variants of SBP

	All Patients n =243	Classical SBP n=48	CNNAs n=166	NB n=29	p-value
Hemoglobin (g/dl)	10.3 ± 1.8	10.2 ± 1.8	10.3 ± 1.8	10.4 ± 1.4	0.88
Platelet count (x10E9/L)	107 (72 – 160)	96.5 (64.5 – 165)	105.5 (72 – 156)	129 (89 – 164)	0.72
Peripheral leucocyte count (10E9/L)	12.3 ± 8.3	12.4 ± 9.4	12.3 ± 8.2	12.3 ± 7.1	0.99
Neutrophils (%)	78.3 ± 11.4	82.1 ± 10.2	77.2 ± 11.8	78.6 ± 10.0	0.03
Total Bilirubin (mg/dl)	4.1 (2.3 – 8.0)	4.4 (3.0 – 9.0)	4.1 (2.2 – 7.7)	4.1 (3.1 – 7.4)	0.98
Albumin (gm/dl)	2.1 ± 0.5	2.1 ± 0.5	2.1 ± 0.5	2.1 ± 0.5	0.70
Prothrombin time (sec)	19.9 ± 8.9	18.9 ± 6.7	20.1 ± 9.3	20.1 ± 9.4	0.71
Creatinine (mg/dl)	1.3 (1.0 – 1.9)	1.2 (1.0 – 1.9)	1.3 (0.9 – 2.0)	1.4 (1.1 – 1.9)	0.82
Sodium (mmol/L)	127.7 ± 7.0	128.6 ± 6.6	127.6 ± 7.2	127.0 ± 6.4	0.56
Potassium (mmol/L)	4.4 ± 1.0	4.3 ± 0.8	4.4 ± 1.0	4.6 ± 0.8	0.52
Bicarbonate (mmol/L)	16.7 ± 4.6	16.7 ± 4.9	16.9 ± 4.4	15.4 ± 5.1	0.27
Ascitic fluid TLC (10x3/uL)	1400 (700 - 3500)	2950 (1150 - 6526)	1500 (800 - 3400)	300 (170-500)	<0.001
Ascitic fluid PMN(%)	73.0 ± 22.3	85.5 ± 14.0	72.4 ± 21.2	56.0 ± 27.8	<0.001
Poly in ascitic fluid (10x3/uL)	960 (360 – 2805)	2727.5 (805 – 2727.5)	1006 (480 - 2736)	150 (115 – 200)	<0.001
Positive Blood Culture	37 (15.2)	16 (33.3)	21 (12.7)	0 (0.0)	<0.001
Positive Ascites Fluid Culture	75 (30.9)	48 (100)	0 (0.0)	27 (93.1)	<0.001
Appropriate antibiotic received	89 (36.6)	43(89.6)	21 (12.6)	25 (86.2)	<0.001
CTP score	10.9 ± 2.0	10.9 ± 1.6	10.9 ± 2.2	11.2 ± 2.1	0.82
MELD score	22.4 ± 7.9	22.5 ± 6.6	22.4 ± 8.0	22.7 ± 9.3	0.97
CTP class B C	61 (25.1) 182 (74.9)	8 (16.7) 40 (83.3)	45 (27.1) 121 (72.9)	8 (27.6) 21 (72.4)	0.32
Duration of antibiotics (days)	9.2 ± 3.9	8.8 ± 4.8	9.2 ± 3.6	9.7 ± 4.1	0.60
Concomitant HCC	59 (24.3)	7 (14.6)	41 (24.7)	11 (37.9)	0.07
Length of hospital stay (days)	5.1 ± 3.0	5.3 ± 3.6	5.0 ± 2.8	5.3 ± 3.0	0.78
The second episode of SBP	7 (2.9)	1 (2.1)	6 (3.6)	0 (0.0)	0.84

CNNA= Culture Negative Neutrocytic Ascites, NB= Non-neutrocytic Bacterascites

Bacterial growth was reported in 75 ascitic fluid samples (positive culture) (**Table 3**), these included 59 gram-negative bacteria (E. coli [n= 49], Pseudomonas Aeruginosa [n= 9], Klebsiella [n= 2] and Acinetobacter [n=2]), 11 (16%) gram-positive bacteria (Streptococcus [n= 7] and Enterococcus [n= 5]), while 3 samples had 2 or more species of microorganisms.

Table 3: Blood and ascitic fluid cultures at baseline

Variables	N (%)
Blood culture positive	37(15.2)
Organism	
E. Coli	18 (7.4)
Streptococcus	10 (4.1)
Pseudomonas	2 (0.8)
Klebsiella	3 (1.2)
Enterococcus	2 (0.8)
Bacteroid	1 (0.4)
Corynebacterium	1 (0.4)
Acinetobacter	1 (0.4)
Sensitivity	
Ceftriaxone	11 (4.5)
Piperacillin	6 (2.5)
Meropenem	10 (4.1)
Augmentin	3 (1.2)
Polymyxin	1 (0.4)
Vancomycin	6 (2.5)
Positive ascitic fluid	75 (30.9)
Organism isolated	
E. coli	49 (20.2)
Streptococcus	7 (2.9)
Pseudomonas	9 (3.7)
Klebsiella	2 (0.8)
Enterococcus	5 (2.1)
Bacteroids	1 (0.4)
E. Coli + Clostridium + Bacteroides	2 (0.8)
Klebsiella + Enterobacter	2 (0.8)
Acinetobacter	2 (0.8)
Sensitivity	
Ceftriaxone	26 (10.7)
Piperacillin/tazobactam	23 (9.5)
Meropenem	21 (8.6)
Augmentin	5 (2.1)
Polymyxin	1 (0.4)
Vancomycin	2 (0.8)
Appropriate antibiotic received	84 (91.3)

Although it was not statistically significant the overall mortality was marginally more in NB and CNNA as compared to classical SBP (**Table 4** and **Figure 1**). While among the different variants of SBP, higher mortality was noted in classical SBP at 1 month, 6 months, and 12 months (31.2%,7.7%, and 30.0 % respectively) as compared to the other two groups: CNNA (15.1%,5.7%, and 20%,), NB (20.7%,4.8%,21.4%) respectively: however, these differences were not statistically significant. Out of the 84 mortalities, 35 were due to septic shock, 40 were due to multi-organ failure and 09 patients died due to unknown reasons.

Figure 1

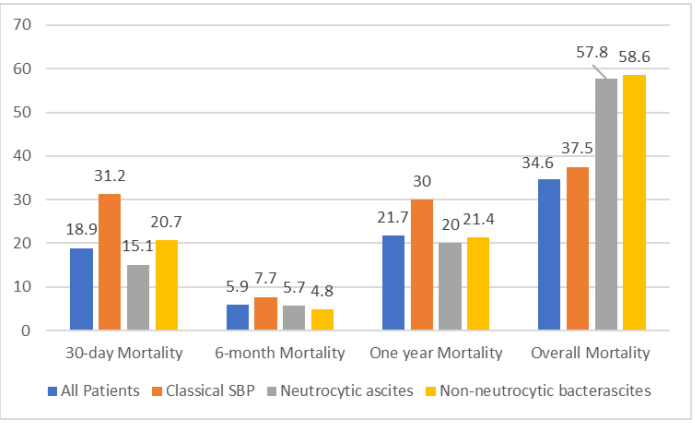

Figure 1: Mortality associated with SBP and subtypes

Table 4: Thirty-day, six-month, and one-year mortality among variants of SBP

	All Patients n =243	Classical SBP n=48	CNNA n=166	NB n=29	p-value
30-day outcome Alive Expired Lost to follow up	169 (69.6) 46 (18.9) 28 (11.5)	26 (54.2) 15 (31.2) 7 (14.6)	122 (73.5) 25 (15.1) 19 (11.4)	21 (72.4) 6 (20.7) 2 (6.9)	0.09
6-month outcome Alive Expired Lost to follow up	129 (76.3) 10 (5.9) 30 (17.8)	20 (77.9) 12 (7.7) 4 (15.4)	95 (77.9) 7 (5.7) 20 (16.4)	14 (66.7) 1 (4.8) 6 (28.6)	0.67
One year outcome Alive Expired Lost to follow up	72 (55.8) 28 (21.7) 29 (22.5)	9 (45.0) 6 (30.0) 5 (25.0)	56 (58.9) 19 (20.0) 20 (21.1)	7 (50.0) 3 (21.4) 4 (28.6)	0.73
Overall outcome Alive Expired Lost to follow up	131 (53.9) 84 (34.6) 28 (11.5)	23 (47.9) 18 (37.5) 7 (14.6)	51 (30.7) 96 (57.8) 19 (11.5)	10 (34.5) 17 (58.6) 2 (6.9)	0.13
Reason for expiry Septic shock Multi-organ failure Others	35 (41.7) 40 (47.6) 09 (10.7)	14 (63.6) 7 (31.8) 1 (4.6)	16 (30.8) 29 (55.8) 7 (13.5)	5 (50.0) 4 (40.0) 1 (10.0)	0.11

CNNA= Culture Negative Neutrocytic Ascites, NB= Non-neutrocytic Bacterascites

Factors associated with overall mortality (on a multi-variate analysis) included female gender, diabetes mellitus, high MELD and CTP score, and concomitant HCC. Encephalopathy, abdominal distension, ascitic neutrophils count, CTP class, total bilirubin, creatinine, prothrombin time, appropriate antibiotic received, and bicarbonate level were also found significant at univariate analysis only (**Table 5**).

Table 5: Factors predicting overall mortality

	Univariate		Multivariable	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Type of SBP Classical Culture-negative neurotic ascites Non-neutrocytic bactrascites	2.41 (1.19 – 4.86) Ref 1.11 (0.47 – 2.59)	0.05	4.29 (1.77 – 10.42) Ref 0.76 (0.26 – 10.42)	0.001 Ref NS
Gender Female Male	1.70 (0.98 – 2.97) Ref	0.06	3.97 (1.85 – 8.53) Ref	<0.001
Diabetes	1.18 (0.68 – 2.05)	0.55	2.46 (1.20 – 5.04)	0.01
MELD score	1.13 (1.08 – 1.18)	<0.001	1.12 (1.05 – 1.20)	<0.001
CTP score	1.55 (1.32 – 1.82)	<0.001	1.34 (1.05 – 1.71)	0.02
Concomitant HCC	2.22 (1.16 – 4.26)	0.02	3.93 (1.68 – 9.21)	0.002

Encephalopathy, Abdominal distension, Neutrophils, CTP class, total bilirubin, creatinine, prothrombin time, appropriate antibiotic received, and bicarbonate were also found significant at univariate analysis.

DISCUSSION:

Patients with cirrhosis and ascites are potentially at risk of developing SBP. Our study demonstrated high mortality and morbidity associated with SBP, necessitating early identification and treatment. Lower TLC and PMN counts in NB may mislead, therefore clinical correlation can aid in the prompt administration of antibiotics. We also found higher overall mortality in NB and CNNA as compared to classical SBP, in contrast to higher 1-month, 6-month, and 12-month mortality observed in classical SBP though the difference was not statistically significant.

The majority of the patients who present with SBP have advanced liver disease with high CTP and MELD scores, and as such have a poor prognosis. Our study demonstrates and supports the above notion. Most of our patients had liver cirrhosis attributed to underlying HCV infection, which is the leading cause of liver cirrhosis in Pakistan. SBP has a wide range of clinical manifestations, although some patients may be

asymptomatic as well. Most patients present with abdominal pain, distension, and fever. Nevertheless, other relatively uncommon presentations like portosystemic encephalopathy, variceal bleeding, diarrhea, and even septic shock can be the initial presenting feature in SBP.

SBP is treatable but requires early diagnosis as mortality in an untreated patient with SBP is very high (12). Its diagnosis requires routine examination of ascitic fluid including leucocyte count per cubic millimeter, as well as absolute PMN count per cubic millimeter along with ascitic fluid culture. Hence, the probability to miss treating NB remains high if the clinical picture is not correlated. In our study, the prevalence of NB was found to be 11.9 %. These figures were similar to that of another local study conducted a few years ago.

Although NB is thought to be a relatively asymptomatic condition, few patients with NB in our observation did present with signs of ascitic fluid infection (encephalopathy, nausea, vomiting, diarrhea). As compared to classical SBP, the associated mortality in patients with NB is considered to be low (12), however, NB may rapidly evolve into classical SBP in up to 38% of cases (23). The overall mortality in NB was higher in our study as compared to the other two groups, this may be because NB is considered a relatively benign condition which may have been attributed to delay in initiating antibiotics and early care. Another reason could be the fact that most of these patients already had very advanced liver disease (CTP score >10, MELD > 22). Therefore, such patients need to be treated early with appropriate antibiotics, to prevent further morbidity and mortality.

In most cases of SBP, only one type of organism is found in the culture (monomicrobial growth) and this results from bacteria translocation from the gut microflora (4). Gram-negative bacteria (especially Escherichia coli) are the most commonly isolated organism (67%) (25). Our study further confirmed this finding, with E. coli being isolated from 65% of the samples.

Upon comparing the 1-month, 6-month, and 12-month mortality among different variants of SBP, we did not find any statistically significant difference favoring one variant over another. This could be because the study is conducted in an academic hospital where care is particularly delivered and practices are monitored as per the standard of care. This finding was important as it is traditionally thought that NB, as opposed to classical SBP and CNNA, is relatively benign and usually does not require treatment unless symptomatic or progresses to classical SBP (26). Of the selected cohort, approximately one-third of the patients lost to follow-up at 1 year. The reason for this high figure may be the fact that liver cirrhosis, as a chronic illness, has a lot of economic burden on many of these patients, and as a result, they cannot afford regular check-ups with their physicians.

In our study, the presence of classical SBP, DM, higher CTP and MELD scores, concomitant HCC, and male genders were associated with high overall mortality. The prognosis can be improved by identifying patients with an increased risk of mortality. Hence, it is important to recognize factors that can affect prognosis in SBP patients so that high-risk patients can be ascertained and subsequently further complications including death can be prevented (27)

Study Limitations

Our study had a few limitations. Firstly, the fact that it was conducted at a single center may limit the generalizability of our findings to the broader community. However, it is worth noting that the Aga Khan University (AKU) is one of the largest tertiary care centers in Pakistan and receives referrals from a wide range of patients with liver diseases, including those with spontaneous bacterial peritonitis (SBP), providing a reasonably representative sample. Additionally, our study had one of the largest sample sizes among studies conducted in this region, partially mitigating this limitation. Secondly, since this was a retrospective analysis, selection bias may have influenced our results. However, we included all patients presented during the study period. Thirdly, a large number of patients were lost to follow-up after one year. However, this is reflective of the challenges faced by patients with chronic illnesses in real-life situations, where the financial burden of managing their condition can make it difficult to attend clinic visits regularly.

CONCLUSION:

Spontaneous bacterial peritonitis, a grave complication of chronic liver disease, is associated with high mortality and morbidity, necessitating early identification and treatment. Lower TLC and PMN counts in NB may mislead, therefore clinical correlation can aid in the prompt administration of antibiotics. Although not statistically significant, overall mortality was higher in NB and CNNA, in contrast, classical SBP had higher 1-, 6-, and 12-month mortality. To determine the overall management of such individuals, the prognostic factors for mortality with SBP must be considered.

Declarations: Nothing to declare

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